

# Occupational Therapy Service Delivery Among Medicaid-Enrolled Children and Adults on the Autism Spectrum and With Other Intellectual Disabilities

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**Importance:** Rates of occupational therapy service utilization among people with autism spectrum disorder (ASD) or intellectual disability (ID) have not been explored in population-based samples.

**Objective:** To describe occupational therapy services delivered to Medicaid-eligible persons younger than age 65 yr identified as having ASD, ID, or both and to evaluate demographic factors associated with occupational therapy service utilization in this population.

**Design:** Retrospective, case-control, cohort study using claims records from Medicaid Analytic eXtract files (2009–2012).

**Setting:** Data from all 50 states and Washington, DC.

**Participants:** Beneficiaries identified as having ASD only, ASD+ID, or ID only who were younger than age 18 yr ( $N = 664,214$ ) and ages 18–64 yr ( $N = 702,338$ ).

**Outcomes and Measures:** We analyzed *Current Procedural Terminology*<sup>®</sup> and Healthcare Common Procedure Coding System procedure codes, Medicaid Statistical Information System type of service codes, and Center for Medicare & Medicaid Services provider specialty codes.

**Results:** Only 3.7% to 6.3% of eligible adult beneficiaries received occupational therapy; in contrast, 20.5% to 24.2% of children received occupational therapy. Significant predictors of service use varied by group; however, differences by race-ethnicity, eligibility on the basis of poverty, and geographic location were observed. Among children, the most frequent billing code was for “therapeutic activities” (43%–60%); among adults, it was “community/work reintegration training” (29%–39%).

**Conclusions and Relevance:** Billed procedure code patterns do not consistently reflect the unique occupational focus that occupational therapy providers deliver to people with developmental disabilities. Disparities in occupational therapy receipt warrant further attention to understand the social and structural factors affecting service delivery.

**What This Article Adds:** Occupational therapy services paid for by Medicaid are used more frequently by children with ASD and ID than by adults with these diagnoses. Greater understanding of the intersectional factors that drive service delivery and disparities is needed.

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Occupational therapy, as a habilitation profession (American Occupational Therapy Association, 2020), addresses outcomes that are valued by people on the autism spectrum and with related developmental disabilities. Children on the autism spectrum

frequently use occupational therapy services, and a great deal of research details specific intervention approaches used by pediatric occupational therapy practitioners (e.g., sensory integration; Watling & Hauer, 2015). However, rates of occupational therapy

service utilization decline significantly in adolescence (Cidav et al., 2013) despite occupational therapy practitioners having the skills to address outcomes valued by autistic individuals,<sup>1</sup> including mental health, quality of life, sleep, activities of daily living (ADLs), and work participation (Benevides et al., 2020). It is unclear from research literature the extent to which occupational therapy is being delivered to people across the lifespan or what types of occupational therapy services are being delivered.

Services in childhood are frequently supported through educational systems, but services delivered and billable through private insurance or Medicaid waivers vary by coverage and age. Autistic individuals frequently require continued supports during the post-secondary transition and adulthood period, but services tend to end for both medical and education settings after people transition out of school (Roux et al., 2013, 2020; Shattuck et al., 2012). Some people may continue to be eligible for publicly available insurance such as Medicaid or Medicare across the early adult transition period and through adulthood via disability programs. Research has revealed a diverse publicly insured autistic adult cohort who continue to receive a variety of services across the lifespan (Benevides et al., 2019; Schott et al., 2021; Shea et al., 2018, 2019; Turcotte et al., 2016). Occupational therapy health services researchers have identified gaps in health care outcomes that are amenable to intervention (e.g., Gilmore et al., 2021; Hand et al., 2020); thus, an opportunity has been created for researchers to understand and quantify occupational therapy service delivery patterns and gaps that could inform future practice and policy using large-scale data and population-based samples.

Population-based evidence is needed to better understand occupational therapy service delivery that is occurring across the lifespan for autistic people and those with related developmental conditions. Descriptive cohort analyses can reveal patterns in billing and service delivery that suggest underlying trends that may require educational or policy changes; in addition, they may suggest opportunities for practice expansion. As some practice areas experience growth in patient populations, our profession needs to be aware of the demand and the supply of occupational therapy providers; thus, educational programs should include content related to developmental conditions in adult intervention courses, not just pediatric courses. Reimbursement policy and legislation that include age caps on waivers or funding caps on services delivered by professionals serving this population may need research evidence to support advocacy efforts to improve service access. To better support occupational

therapy practice and policy changes for autistic people and those with related developmental conditions, a large U.S. study of national scope is needed to document the frequency of occupational therapy service utilization by age and other demographic characteristics, the most frequently used occupational therapy billable services, and the occupational therapy provider availability to support such services.

The purpose of this study was to describe occupational therapy services for autistic people and those with other developmental conditions across the lifespan from across all 50 states and Washington, DC. The following research questions were used:

1. Among Medicaid-insured autistic people and those with other developmental disabilities, who is likely to receive occupational therapy services?
2. What are the procedure codes that occupational therapy providers bill for most frequently when serving children and adults with diagnosis codes for autism spectrum disorder (ASD), an intellectual disability (ID), or both?

For Research Question 1, we hypothesized that occupational therapy service delivery would differ by age and co-occurring ID, which is frequently a marker of increased functional needs (e.g., Buescher et al., 2014). We had no expectations about the frequencies of billed procedure codes, so we present no hypothesis for Research Question 2.

## Method

### Design and Data Source

We conducted a retrospective case-control cohort study of existing claims records to describe people receiving and not receiving occupational therapy services. We used the Centers for Medicare and Medicaid Services (CMS) Medicaid Analytic eXtract (MAX) files for the service years ranging from 2009 to 2012 that contained claims on beneficiaries with ASD, ID, or both. These files are research-identifiable claims records with the ability to link beneficiary demographics from the Personal Summary File with claims for health care services across outpatient, inpatient, long-term care, emergency, and acute care settings and medication files. Analysis of these data for health services research purposes underwent institutional review board approval at Drexel University (Protocol 1603004379); all analyses were conducted at Drexel University. Protocol details can be furnished on request.

Claims records include diagnosis codes, *Current Procedural Terminology*<sup>®</sup> (CPT<sup>®</sup>) and Healthcare Common Procedure Coding System (HCPCS) procedure codes, Medicaid Statistical Information System (MSIS) type of service codes, and CMS specialty codes, hereafter referred to as “procedure codes,” “type of service codes,” or “CMS provider specialty codes,” respectively (American Medical Association, 2017; Centers for Medicare & Medicaid Services, 2004; Centers for Medicare & Medicaid Services, 2012; ResDac,

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<sup>1</sup>We primarily use the identity-first term *autistic individuals* when referring to adults, which honors the lived experience and preferences of the autism community (Bury et al., 2020; Kenny et al., 2016). When referring to children or people with other developmental conditions, we continue to use person-first language.

n.d.). Type of service codes defines the service (e.g., “home health,” “physical therapy, occupational therapy, speech and hearing services,” “outpatient hospital”), and provider specialty codes define the provider who delivered the claim service. CMS specialty codes were used to identify occupational therapy providers.

## Sample Identification

We identified beneficiaries with either ASD (*International Classification of Diseases–Ninth Revision–Clinical Modification* [ICD–9–CM; Centers for Disease Control and Prevention, 2011] Code 299.xx) or ID (ICD–9–CM Codes 317–319.xx) as those with at least two outpatient claims or at least one inpatient claim with the ICD–9–CM diagnosis code at any year. Three groups were analyzed: ASD without ID (ASD only), ASD with ID (ASD+ID), and ID without ASD (ID only). People with end-stage renal disease were excluded because they frequently require different types of care. A total of 1,366,552 beneficiaries were included. We selected specific demographic and social characteristics that are frequently associated with service utilization and are markers of disparities. Age was calculated at the first observed month of enrollment. Gender and race–ethnicity were extracted from the MAX Personal Summary File. We determined urbanicity by using zip code and 2010 census urban and rural classification. We defined eligibility category using the most frequent MAX uniform eligibility codes.

## Identification of Occupational Therapy Services

Any claims that met one of the following criteria were flagged as “occupational therapy services”: (1) claims in which the CMS provider specialty code of “67” (occupational therapist) was documented or (2) any claim from another type of service or group that may bill on behalf of occupational therapy practitioners (e.g., ambulatory health center) plus a CPT code that falls under the occupational therapy scope of practice. A list of the CPT procedure codes used for the purpose of this research can be obtained from the first author.

## Types of Occupational Therapy Billed Services

Among available claims flagged as occupational therapy services, the procedure codes associated with those occupational therapy claims were summarized by frequency. No selection process was used for procedure codes. Examples of procedure codes include CPT 97110<sup>2</sup> (defined as “Therapeutic procedure, one or

more areas, each 15 min; therapeutic exercises to develop strength and endurance, range of motion and flexibility”) and CPT 97535 (defined as “Self-care/home management training, direct one-on-one contact, each 15 min”). The most frequently billed occupational therapy procedure codes were identified from the procedure code field available in the claim.

## Data Analysis

We provide frequencies and percentages of demographic characteristics of unique people receiving or not receiving occupational therapy services by group (ASD only, ASD+ID, ID only) and by age (<18 yr, 18–64 yr). Logistic regression was used to examine the odds of receiving occupational therapy within each group by demographic characteristic, and odds ratios and 95% confidence intervals were calculated, adjusted on the other demographic characteristics. Frequency of billing specific procedure codes is summarized across the 4-yr period for each group. We report the 10 most frequent claim procedure codes billed by occupational therapy providers, which captured between 96% and 99% of all occupational therapy claims for each group.

## Results

Demographic characteristics are presented in Tables 1 (age <18 yr) and 2 (ages 18–64 yr); the results of logistic regression predicting the odds of receiving occupational therapy for each group (ASD only, ASD+ID, ID only) by specific predictors are also shown. A greater proportion of children with ASD+ID received occupational therapy (29.2%) than did children with ASD only (24.2%) or ID only (20.5%). Similarly, a greater proportion of adults with ASD+ID received occupational therapy (6.3%) than did adults with ASD only (3.7%) or ID only (4.7%).

Several demographic predictors were associated with occupational therapy service receipt, including age, gender, race–ethnicity, Medicaid reason for eligibility (e.g., poverty), and urbanicity (see Tables 1 and 2, “Predictors of Occupational Therapy Service Receipt” column). Generally, among children and adolescents, children and adolescents between ages 6 and 17 yr were significantly less likely to have received occupational therapy than children ages 0 to 5 yr across all groups. Among adults with ASD only, those between ages 35 and 64 yr were significantly more likely than those ages 18 to 24 yr to receive occupational therapy. The opposite pattern was observed among adults with ASD+ID and ID only; people 25 to 64 years old were significantly less likely to receive occupational therapy than those ages 18 to 24 yr.

The most frequently occurring occupational therapy procedure codes by group and age (<18 yr, ≥18 yr) are presented in Table 3. The majority of children and adolescents, regardless of group, received therapeutic activities (CPT 97530) and therapeutic exercises

<sup>2</sup>Codes shown refer to CPT 2017 (American Medical Association, 2017, CPT 2017 standard, Chicago: American Medical Association Press) and do not represent all of the possible codes that may be used in occupational therapy evaluation and intervention. After 2017, refer to the current year’s CPT code book for available codes. CPT codes are updated annually and become effective January 1. CPT is a trademark of the American Medical Association. CPT five-digit codes, two-digit codes, modifiers, and descriptions are copyright © 2017 by the American Medical Association. All rights reserved.

**Table 1. Demographic Characteristics of Total Available Sample of Medicaid-Enrolled Children and Adolescents With ASD or ID (Younger Than Age 18 yr) and Predictors of Occupational Therapy Service Receipt, 2009–2012 (N = 664,214)**

Characteristic	n (%)			Predictors of Occupational Therapy Service Receipt, OR [95% CI] <sup>a</sup>		
	ASD Only (n = 351,361)	ASD+ID (n = 75,555)	ID Only (n = 237,298)	ASD Only	ASD+ID	ID Only
Received occupational therapy treatment	84,891 (24.2)	22,091 (29.2)	48,650 (20.5)	Outcome variable	Outcome variable	Outcome variable <sup>b</sup>
Age at enrollment, yr						
0–5 (Ref.)	165,823 (47.2)	18,571 (24.6)	65,605 (27.6)			
6–12	136,665 (38.9)	33,658 (44.5)	92,377 (38.9)	0.49 [0.48, 0.50]*	0.57 [0.54, 0.59]*	0.61 [0.60, 0.63]*
13–17	48,873 (13.9)	23,326 (30.9)	79,316 (33.4)	0.15 [0.15, 0.16]*	0.22 [0.21, 0.23]*	0.27 [0.26, 0.28]*
Sex						
Male (Ref.)	277,232 (78.9)	56,798 (75.2)	139,860 (58.9)			
Female	74,073 (21.1)	18,755 (24.8)	97,424 (41.1)	0.95 [0.93, 0.97]*	1.05 [1.01, 1.09]*	1.03 [1.01, 1.05]*
Race–ethnicity						
White (Ref.)	181,255 (51.6)	38,605 (51.1)	108,389 (45.7)			
Black	55,659 (15.8)	13,394 (17.7)	54,400 (22.9)	0.64 [0.63, 0.66]*	0.65 [0.62, 0.68]*	0.60 [0.58, 0.61]*
Asian/Pacific Islander	7,425 (2.1)	2,507 (3.3)	7,102 (3.0)	0.60 [0.56, 0.63]*	0.48 [0.43, 0.53]*	0.52 [0.49, 0.56]*
Hispanic/Latino	61,820 (17.6)	10,231 (13.5)	36,295 (15.3)	0.88 [0.86, 0.90]*	0.67 [0.64, 0.71]*	0.71 [0.69, 0.73]*
Other	45,202 (12.9)	10,818 (14.3)	31,112 (13.1)	1.21 [1.18, 1.24]*	1.25 [1.19, 1.31]*	1.14 [1.11, 1.18]*
Urbanicity						
Urban (Ref.)	248,210 (70.6)	53,418 (70.7)	161,029 (67.9)			
Suburban	30,840 (8.8)	6,724 (8.9)	23,531 (9.9)	1.01 [0.98, 1.04]	0.99 [0.94, 1.05]	0.85 [0.82, 0.88]*
Rural	63,439 (18.1)	13,250 (17.5)	47,490 (20.0)	0.90 [0.89, 0.92]*	0.99 [0.95, 1.03]	0.81 [0.79, 0.83]*
Missing	8,872 (2.5)	2,163 (2.9)	5,248 (2.2)	0.69 [0.65, 0.73]*	0.82 [0.74, 0.91]*	0.83 [0.77, 0.90]*
Eligibility category						

(Continued)

(CPT 97110), with 76% to 79% of the pediatric samples having claims with these procedure codes. Therapeutic activities and therapeutic exercises also made up the majority of billed claims for adults with ASD only (46%). Among adults with ASD+ID and ID only, community/work reintegration (CPT 97537: ASD+ID, 39%; ID only, 39%) was also frequently billed.

## Discussion

People with developmental conditions, such as those with ASD, ID, or both ASD and ID, tend to have specific needs that vary across the lifespan and that remain unmet (e.g., Schott et al., 2021). Lack of regular and sustained supports across the transition-to-adult period is linked to poor adult health outcomes among people with developmental disabilities (Anderson et al., 2018; Cheak-Zamora & Teti, 2015). The occupational therapy profession offers skilled services to address many of the areas that are reported challenges. No studies to our knowledge have examined occupational therapy trends

and billing practices for people with developmental conditions from large administrative claims samples to determine patterns of service use to inform policy and practice initiatives. Within our large Medicaid-enrolled sample of people with developmental conditions, we identified three main results that affect occupational therapy service delivery.

First, we found that occupational therapy service delivery for unique age cohorts of Medicaid-insured children and adolescents with ASD, ID, or both decreases between ages 5 and 17 yr, which supports earlier work suggesting that occupational therapy services decline through adolescence (Cidav et al., 2013). A novel result is that rates of occupational therapy service delivery remained low for all beneficiaries with developmental disabilities in adulthood, with only approximately 4% to 6% of eligible people with ASD only, ASD+ID, or ID only having billed occupational therapy services across the period ranging from 18 to 64 yr. Less is known about the complexities of aging with various developmental conditions; however, it is clear that occupational therapy practitioners will need to develop knowledge in understanding how to support

**Table 2. Demographic Characteristics of Total Available Sample of Medicaid-Enrolled Adults With ASD or ID (Ages 18–64 yr) and Predictors of Occupational Therapy Service Receipt, 2009–2012 (N = 702,338)**

Characteristic	n (%)			Predictors of Occupational Therapy Service Receipt, OR [95% CI] <sup>a</sup>		
	ASD Only (n = 45,650)	ASD+ID (n = 60,048)	ID Only (n = 596,640)	ASD Only	ASD+ID	ID Only
Received occupational therapy treatment	1,686 (3.7)	3,782 (6.3)	27,931 (4.7)	Outcome variable	Outcome variable	Outcome variable <sup>b</sup>
Age at enrollment, yr						
18–24 (Ref.)	26,333 (57.7)	25,230 (42.0)	126,295 (21.2)			
25–34	10,223 (22.4)	16,124 (26.9)	134,798 (22.6)	0.85 [0.75, 0.97]*	0.74 [0.69, 0.81]*	0.75 [0.72, 0.78]*
35–44	4,640 (10.2)	9,672 (16.1)	129,292 (21.7)	1.18 [1.01, 1.38]*	0.60 [0.54, 0.67]*	0.72 [0.69, 0.74]*
45–54	3,369 (7.4)	6,942 (11.6)	143,079 (24.0)	1.45 [1.23, 1.71]*	0.62 [0.56, 0.70]*	0.71 [0.69, 0.74]*
55–64	1,085 (2.4)	2,080 (3.5)	63,176 (10.6)	1.55 [1.19, 2.02]*	0.70 [0.58, 0.84]*	0.72 [0.69, 0.76]*
Sex						
Male (Ref.)	33,660 (73.7)	43,136 (71.8)	321,450 (53.9)			
Female	11,990 (26.3)	16,912 (28.2)	275,186 (46.1)	1.65 [1.49, 1.83]*	1.28 [1.20, 1.38]*	1.24 [1.21, 1.27]*
Race–ethnicity						
White (Ref.)	30,196 (66.1)	38,169 (63.6)	387,777 (65.0)			
Black	6,091 (13.3)	11,973 (19.9)	117,985 (19.8)	0.63 [0.53, 0.75]*	0.64 [0.58, 0.70]*	0.79 [0.76, 0.82]*
Asian/Pacific Islander	1,031 (2.3)	1,620 (2.7)	12,435 (2.1)	0.70 [0.48, 1.03]	0.43 [0.33, 0.57]*	0.48 [0.43, 0.54]*
Hispanic/Latino	2,983 (6.5)	4,103 (6.8)	45,540 (7.6)	0.71 [0.57, 0.89]*	0.44 [0.37, 0.53]*	0.44 [0.41, 0.47]*
Other	5,349 (11.7)	4,183 (7.0)	32,903 (5.5)	1.14 [0.99, 1.32]	0.70 [0.61, 0.81]*	0.81 [0.77, 0.86]*
Urbanicity						
Urban (Ref.)	32,898 (72.1)	43,851 (73.0)	409,748 (68.7)			
Suburban	3,664 (8.0)	4,932 (8.2)	57,719 (9.7)	0.93 [0.78, 1.12]	0.87 [0.77, 0.99]*	0.87 [0.83, 0.91]*
Rural	8,194 (17.9)	9,623 (16.0)	115,186 (19.3)	0.97 [0.85, 1.10]	1.16 [1.06, 1.26]*	1.03 [1.00, 1.07]
Missing	894 (2.0)	1,642 (2.7)	13,987 (2.3)	0.69 [0.45, 1.05]	0.50 [0.38, 0.67]*	0.60 [0.54, 0.67]*

(Continued)

people with developmental conditions in their self-management of chronic conditions commonly associated with older adults.

Second, we found that occupational therapy service receipt was predicted by other demographic characteristics besides age; consistent across both children and adults was that racial and ethnic minorities were significantly less likely to receive occupational therapy. Our study did not examine need-based reasons for treatment (e.g., care complexity or co-occurring conditions); therefore, additional study is warranted to obtain a nuanced understanding of predictors of occupational therapy service use. Racial and ethnic disparities in diagnosis, access to care, and service utilization have been well documented among autistic individuals (e.g., [Durkin et al., 2017](#); [Singh & Bunyak, 2019](#); [Wiggins et al., 2020](#)). Intersectional disparities in access to care for people living in rural communities and people with low income have also been part of the national conversation on health outcomes (e.g., [Caldwell et al., 2016](#)). Contributions of racism and systemic barriers have not been solidly examined in the context

of occupational therapy service delivery, and a continued need exists for evaluation of factors that contribute to the understanding of systems that promote racism (e.g., [Johnson et al., 2021](#); [Johnson & Lavalley, 2021](#)).

Third, we found that the type of billed occupational therapy service delivery codes differed for children and adults. Although therapeutic activities and therapeutic exercises were commonly billed in pediatric and adult samples, billing codes that are uniquely occupational therapy focused were less frequently documented. For example, self-care/home management training (CPT 97535) encompassing therapy activities related to ADLs and instrumental activities of daily living (IADLs) was infrequently billed in childhood, with between 5% and 8% of claims focused on this procedure code. In contrast, this code was documented twice as frequently among adult claims. Although self-care is addressed in both childhood and adulthood, one possible explanation is that the increase in billing for this code in adulthood could be because of adults seeking occupational therapy providers for services



**Table 3. Most Frequently Used CPT® Procedure Codes Among Occupational Therapy Claims for Medicaid-Enrolled Children, Adolescents, and Adults With ASD, ASD+ID, and ID Only, 2009–2012**

ASD-Only Claims		ASD+ID Claims		ID-Only Claims	
Procedure Code <sup>a</sup>	Frequency (%)	Procedure Code <sup>a</sup>	Frequency (%)	Procedure Code <sup>a</sup>	Frequency (%)
<b>Children and Adolescents (Total No. of Claims = 8,346,801)</b>					
<b>No. of Claims = 4,392,615</b>		<b>No. of Claims = 1,189,392</b>		<b>No. of Claims = 2,764,794</b>	
97530	2,615,172 (60)	97530	621,580 (52)	97530	1,202,485 (43)
97110	855,159 (19)	97110	286,526 (24)	97110	1,004,560 (36)
97150	323,903 (7)	97150	110,526 (9)	97150	223,484 (8)
97535	257,237 (6)	97535	93,902 (8)	97535	135,207 (5)
97112	117,224 (3)	97112	25,682 (2)	97112	95,881 (3)
97533	71,184 (2)	97533	17,088 (1)	97003	25,182 (1)
97003	65,579 (1)	97003	13,633 (1)	97533	24,003 (1)
97004	33,994 (1)	97004	4,513 (0.38)	97140	17,435 (1)
97532	24,310 (1)	97532	4,435 (0.37)	97004	7,918 (0.29)
97140	8,612 (0.20)	97140	3,208 (0.27)	97113	7,830 (0.28)
<b>Adults (Total No. of Claims = 1,870,851)</b>					
<b>No. of Claims = 93,608</b>		<b>No. of Claims = 289,344</b>		<b>No. of Claims = 1,487,899</b>	
97537	26,764 (29)	97537	113,046 (39)	97537	586,579 (39)
97530	26,656 (28)	97535	94,639 (33)	97535	385,813 (26)
97110	17,120 (18)	97530	37,170 (13)	97110	243,939 (16)
97535	12,327 (13)	97110	27,941 (10)	97530	155,269 (10)
97150	2,615 (3)	97150	5,615 (2)	97112	23,652 (2)
97140	1,838 (2)	97112	2,121 (1)	97150	21,155 (1)
97112	1,642 (2)	97003	1,827 (1)	97140	16,580 (1)
97003	960 (1)	97533	1,686 (1)	97003	11,459 (1)
97532	899 (1)	97140	1,253 (0.43)	97533	7,027 (0.47)
97035	663 (1)	97004	827 (0.29)	97035	6,565 (0.44)

**Note.** Data source: 2009–2012 Medicaid Analytic eXtract files for all states. Claim frequency was identified as total claims with that *Current Procedural Terminology*® (CPT®) code over the period 2009–2012, with percentage denominator being the total number of claims for that beneficiary group with an occupational therapy–related claim. ASD = autism spectrum disorder; ID = intellectual disability.

<sup>a</sup>97003 = occupational therapy evaluation code (pre-2017); 97004 = occupational therapy reevaluation code (pre-2017); 97035 = ultrasound, each 15 min; 97110 = therapeutic exercises, each 15 min; 97112 = neuromuscular reeducation of movement, balance, coordination; 97113 = aquatic therapy with therapeutic exercise; 97140 = manual therapy techniques; 97150 = therapeutic procedures, group; 97530 = therapeutic activities, direct one-on-one, each 15 min; 97532 = development of cognitive skills to improve attention, memory, and problem solving; 97533 = sensory integrative techniques to enhance sensory

related to home management (IADLs), something that is not typically addressed in childhood.

Possibly because the billing code encompasses two distinct occupations (ADLs and IADLs), it complicates our understanding of the services that are being delivered. Daily living skills are an important predictor of life-course outcomes that transcend ID (Di Rezze et al., 2019), and addressing daily living skills beyond childhood is essential for occupational therapy providers to consider for both children and adults (Bal et al., 2015; Boyd et al., 2014). Other research has found that autistic individuals lack supports for functional, everyday activities that occupational therapy

practitioners typically treat under our scope of practice (e.g., ADLs, IADLs, and occupations such as driving, leisure, and employment; Eismann et al., 2017; Kirby et al., 2020; Orsmond et al., 2013; Stacey et al., 2019). Several longitudinal studies of daily living skills have shown declines or lack of improvement in these skills in adulthood (Bal et al., 2015; Clarke et al., 2021; Smith et al., 2012).

Neuromuscular reeducation (CPT 97112) and sensory integration (CPT 97533) were also among the least frequently billed CPT codes for pediatric clients. These results suggest that although much of the pediatric-focused occupational therapy literature describes

evidence related to sensory processing, sensory integration, and motor function for children with developmental disabilities (e.g., [Kuhaneck et al., 2015](#); [Watling & Hauer, 2015](#)), providers appear to be billing for other procedure codes. Similarly, a great deal of literature details executive functioning challenges among autistic individuals (e.g., [de Vries & Geurts, 2015](#)), and the importance of compensatory cognitive strategies and supports is emphasized for occupational therapy practitioners (e.g., [Tomchek & Koenig, 2016](#)).

Our study demonstrated that very few claims addressed cognitive skills and compensatory approaches for cognition. Claims for this CPT code (97532) composed 1% of the ASD-only child and adult claims and <0.5% of the claims in the adult ASD+ID group. Practitioners should consider ways to promote executive functioning as related to important occupations for people with developmental conditions such as autism. Practice-related trends in billing could reflect coding preferences because of higher rates of reimbursement for some codes versus others, fear of claim denial through use of some codes, or other policy guidance by state or institutions for billing. Future research should explore these reasons to better understand factors affecting occupational therapy's ability to demonstrate its unique value for clients.

## Limitations

Limitations to this study include the frequent criticisms of administrative records: We could not definitively confirm diagnosis or delivery of occupational therapy services. Because these claims are being processed with the diagnostic codes associated with the groups described, our results represent the groups as evaluated. Several claims were missing specific provider CMS specialty code information to classify provider types. Therefore, our estimates are likely an underestimate of occupational therapy services. We are confident that services frequently billed by occupational therapy practitioners and provided in settings in which occupational therapists and occupational therapy assistants work were included. We acknowledge that other providers may be working in settings similar to occupational therapists and billing for services that occupational therapists would bill for.

Finally, MAX files are reported by states, and one state (Idaho) did not report its claims in time for inclusion in the 2012 data release; therefore, we are missing some claims records from that state. Through analyses of the location of billed occupational therapy services, we found that billing for certain procedure codes may be occurring more frequently in some states versus others. More research is needed to disentangle state-specific billing practices that influence providers. State Medicaid policies and waiver programs may vary in terms of the occupational therapy services that are covered, and service coverage can also vary within states by program. A critical next step for this research is to examine inter- and intrastate


variation in occupational therapy service use to begin to identify the impact of these policy differences.

## Implications for Occupational Therapy Practice

Administrative claims records are useful for understanding practice trends and important areas in which the occupational therapy profession is delivering care. The results of this study have the following implications for occupational therapy practice:

- Billing for pediatric occupational therapy services suggests a reliance on therapeutic activities and exercises. To better support our occupational therapy scope of practice for children with developmental conditions and to distinguish ourselves from other professionals, we suggest that providers clearly document the value of occupational therapy in delivering and billing for services aligned with important areas of occupation, such as ADLs, IADLs, play, and community participation.
- Adults with developmental disabilities, including autistic adults with or without ID, infrequently receive occupational therapy services. Practice-related guidance for promoting healthy development of human occupation in these populations is necessary, preferably developed in collaboration with autistic people and those with ID. For example, practice guidance should provide evidence-based approaches for person-centered care models that promote quality of life, improved mental health, and meaningful social and community participation. Educators should present developmental conditions and interventions across the lifespan (not just in pediatric courses).
- Differences in service delivery exist by age, race-ethnicity, and other demographic characteristics. Future research and policy efforts are needed to better understand and address intersectional factors contributing to occupational therapy service delivery barriers. Structural, social, and economic incentives and disincentives driving provider actions and disparate service access among people with intellectual and developmental conditions require investigation.

## Conclusion

Billed procedure code patterns do not consistently reflect the unique occupation focus that occupational therapy providers deliver to people with developmental disabilities across the lifespan, including those on the autism spectrum and those with ID. Disparities in occupational therapy service receipt warrant attention and more nuanced evaluation of complex intersectional factors driving access and service use. 

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## References

- American Medical Association. (2017). *CPT 2017 standard*. American Medical Association Press.
- American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy*, 74(Suppl. 2), 7412410010. <https://doi.org/10.5014/ajot.2020.74S2001>
- Anderson, K. A., Sosnowy, C., Kuo, A. A., & Shattuck, P. T. (2018). Transition of individuals with autism to adulthood: A review of qualitative studies. *Pediatrics*, 141(Suppl. 4), S318–S327. <https://doi.org/10.1542/peds.2016-43001>
- Bal, V. H., Kim, S.-H., Cheong, D., & Lord, C. (2015). Daily living skills in individuals with autism spectrum disorder from 2 to 21 years of age. *Autism*, 19, 774–784. <https://doi.org/10.1177/1362361315575840>
- Benevides, T. W., Carretta, H. J., & Graves, K. Y. (2019). Case identification and characterization of autistic young adults in 2010 Medicare fee-for-service claims. *Autism in Adulthood*, 1, 210–218. <https://doi.org/10.1089/aut.2018.0036>
- Benevides, T. W., Shore, S. M., Palmer, K., Duncan, P., Plank, A., Andresen, M. L., . . . Coughlin, S. S. (2020). Listening to the autistic voice: Mental health priorities to guide research and practice in autism from a stakeholder-driven project. *Autism*, 24, 822–833. <https://doi.org/10.1177/1362361320908410>
- Boyd, B. A., McCarty, C. H., & Sethi, C. (2014). Families of children with autism: A synthesis of family routines literature. *Journal of Occupational Science*, 21, 322–333. <https://doi.org/10.1080/14427591.2014.908816>
- Buescher, A. V., Cidav, Z., Knapp, M., & Mandell, D. S. (2014). Costs of autism spectrum disorders in the United Kingdom and the United States. *JAMA Pediatrics*, 168, 721–728. <https://doi.org/10.1001/jamapediatrics.2014.210>
- Bury, S. M., Jellett, R., Spoor, J. R., & Hedley, D. (2020). “It defines who I am” or “It’s something I have”: What language do [autistic] Australian adults [on the autism spectrum] prefer? *Journal of Autism and Developmental Disorders*. Advance online publication. <https://doi.org/10.1007/s10803-020-04425-3>
- Caldwell, J. T., Ford, C. L., Wallace, S. P., Wang, M. C., & Takahashi, L. M. (2016). Intersection of living in a rural versus urban area and race/ethnicity in explaining access to health care in the United States. *American Journal of Public Health*, 106, 1463–1469. <https://doi.org/10.2105/AJPH.2016.303212>
- Centers for Disease Control and Prevention. (2011). *International classification of diseases, ninth revision, clinical modification (ICD–9–CM)*. <http://www.cdc.gov/nchs/icd/icd9cm.htm>
- Centers for Medicare & Medicaid Services. (2004). *CMS specialty codes/healthcare provider taxonomy crosswalk* (Version 4.0). <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/MedicareProviderSupEnroll/downloads/taxonomy.pdf>
- Centers for Medicare & Medicaid Services. (2012). HCPCS—General information; [modified 2012 July 04; cited 2012 Oct 4]. <https://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/index.htm>
- Cheak-Zamora, N. C., & Teti, M. (2015). “You think it’s hard now . . . It gets much harder for our children”: Youth with autism and their caregiver’s perspectives of health care transition services. *Autism*, 19, 992–1001. <https://doi.org/10.1177/1362361314558279>
- Cidav, Z., Lawer, L., Marcus, S. C., & Mandell, D. S. (2013). Age-related variation in health service use and associated expenditures among children with autism. *Journal of Autism and Developmental Disorders*, 43, 924–931. <https://doi.org/10.1007/s10803-012-1637-2>
- Clarke, E. B., McCauley, J. B., & Lord, C. (2021). Post-high school daily living skills in autism spectrum disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 60, 978–985. <https://doi.org/10.1016/j.jaac.2020.11.008>
- de Vries, M., & Geurts, H. (2015). Influence of autism traits and executive functioning on quality of life in children with an autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 45, 2734–2743. <https://doi.org/10.1007/s10803-015-2438-1>
- Di Rezze, B., Duku, E., Szatmari, P., Volden, J., Georgiades, S., Zwaigenbaum, L., . . . Waddell, C.; Pathways in ASD Study Team. (2019). Examining trajectories of daily living skills over the preschool years for children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 49, 4390–4399. <https://doi.org/10.1007/s10803-019-04150-6>
- Durkin, M. S., Maenner, M. J., Baio, J., Christensen, D., Daniels, J., Fitzgerald, R., . . . Yeargin-Allsopp, M. (2017). Autism spectrum disorder among US children (2002–2010): Socioeconomic, racial, and ethnic disparities. *American Journal of Public Health*, 107, 1818–1826. <https://doi.org/10.2105/AJPH.2017.304032>
- Eismann, M. M., Weisshaar, R., Capretta, C., Cleary, D. S., Kirby, A. V., & Persch, A. C. (2017). Characteristics of students receiving occupational therapy services in transition and factors related to postsecondary success. *American Journal of Occupational Therapy*, 71, 7103100010. <https://doi.org/10.5014/ajot.2017.024927>
- Gilmore, D., Harris, L., Longo, A., & Hand, B. N. (2021). Health status of Medicare-enrolled autistic older adults with and without co-occurring intellectual disability: An analysis of inpatient and institutional outpatient medical claims. *Autism*, 25, 266–274. <https://doi.org/10.1177/1362361320955109>
- Hand, B. N., Angell, A. M., Harris, L., & Carpenter, L. A. (2020). Prevalence of physical and mental health conditions in Medicare-enrolled, autistic older adults. *Autism*, 24, 755–764. <https://doi.org/10.1177/1362361319890793>
- Johnson, K. R., Bogenschutz, M., & Peak, K. (2021). Propositions for race-based research in intellectual and developmental disabilities. *Inclusion*, 9, 156–169. <https://doi.org/10.1352/2326-6988-9.3.156>
- Johnson, K. R., & Lavalley, R. (2021). From racialized think-pieces toward anti-racist praxis in our science, education, and practice. *Journal of Occupational Science*, 28, 404–409. <https://doi.org/10.1080/14427591.2020.1847598>
- Kenny, L., Hattersley, C., Molins, B., Buckley, C., Povey, C., & Pellicano, E. (2016). Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism*, 20, 442–462. <https://doi.org/10.1177/1362361315588200>
- Kirby, A. V., Diener, M. L., Adkins, D. E., & Wright, C. (2020). Transition preparation activities among families of youth on the autism spectrum: Preliminary study using repeated assessments across a school year. *PLoS One*, 15, e0231551. <https://doi.org/10.1371/journal.pone.0231551>
- Kuhaneck, H. M., Madonna, S., Novak, A., & Pearson, E. (2015). Effectiveness of interventions for children with autism spectrum disorder and their parents: A systematic review of family outcomes. *American Journal of Occupational Therapy*, 69, 6905180040. <https://doi.org/10.5014/ajot.2015.017855>



- Orsmond, G. I., Shattuck, P. T., Cooper, B. P., Sterzing, P. R., & Anderson, K. A. (2013). Social participation among young adults with an autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 43, 2710–2719. <https://doi.org/10.1007/s10803-013-1833-8>
- ResDac. (n.d.). MAX other services files, data documentation. <https://resdac.org/cms-data/files/max-ot>
- Roux, A. M., Rast, J. E., & Shattuck, P. T. (2020). State-level variation in vocational rehabilitation service use and related outcomes among transition-age youth on the autism spectrum. *Journal of Autism and Developmental Disorders*, 50, 2449–2461. <https://doi.org/10.1007/s10803-018-3793-5>
- Roux, A. M., Shattuck, P. T., Cooper, B. P., Anderson, K. A., Wagner, M., & Narendorf, S. C. (2013). Postsecondary employment experiences among young adults with an autism spectrum disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 52, 931–939. <https://doi.org/10.1016/j.jaac.2013.05.019>
- Schott, W., Nonnemacher, S., & Shea, L. (2021). Service use and unmet needs among adults with autism awaiting home- and community-based Medicaid services. *Journal of Autism and Developmental Disorders*, 51, 1188–1200. <https://doi.org/10.1007/s10803-020-04593-2>
- Shattuck, P. T., Roux, A. M., Hudson, L. E., Taylor, J. L., Maenner, M. J., & Trani, J. F. (2012). Services for adults with an autism spectrum disorder. *Canadian Journal of Psychiatry*, 57, 284–291. <https://doi.org/10.1177/070674371205700503>
- Shea, L. L., Field, R., Xie, M., Marcus, S., Newschaffer, C., & Mandell, D. (2019). Transition-age Medicaid coverage for adolescents with autism and adolescents with intellectual disability. *American Journal on Intellectual and Developmental Disabilities*, 124, 174–185. <https://doi.org/10.1352/1944-7558-124.2.174>
- Shea, L. L., Xie, M., Turcotte, P., Marcus, S., Field, R., Newschaffer, C., & Mandell, D. (2018). Brief report: Service use and associated expenditures among adolescents with autism spectrum disorder transitioning to adulthood. *Journal of Autism and Developmental Disorders*, 48, 3223–3227. <https://doi.org/10.1007/s10803-018-3563-4>
- Singh, J. S., & Bunyak, G. (2019). Autism disparities: A systematic review and meta-ethnography of qualitative research. *Qualitative Health Research*, 29, 796–808. <https://doi.org/10.1177/1049732318808245>
- Smith, L. E., Maenner, M. J., & Seltzer, M. M. (2012). Developmental trajectories in adolescents and adults with autism: The case of daily living skills. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51, 622–631. <https://doi.org/10.1016/j.jaac.2012.03.001>
- Stacey, T. L., Froude, E. H., Trollor, J., & Foley, K. R. (2019). Leisure participation and satisfaction in autistic adults and neurotypical adults. *Autism*, 23, 993–1004. <https://doi.org/10.1177/1362361318791275>
- Tomchek, S. D., & Koenig, K. P. (2016). *Occupational therapy practice guidelines for children and adolescents with autism spectrum disorder*. American Occupational Therapy Association.
- Turcotte, P., Mathew, M., Shea, L. L., Brusilovskiy, E., & Nonnemacher, S. L. (2016). Service needs across the lifespan for individuals with autism. *Journal of Autism and Developmental Disorders*, 46, 2480–2489. <https://doi.org/10.1007/s10803-016-2787-4>
- Watling, R., & Hauer, S. (2015). Effectiveness of Ayres Sensory Integration® and sensory-based interventions for people with autism spectrum disorder: A systematic review. *American Journal of Occupational Therapy*, 69, 6905180030. <https://doi.org/10.5014/ajot.2015.018051>
- Wiggins, L. D., Durkin, M., Esler, A., Lee, L. C., Zahorodny, W., Rice, C., . . . Baio, J. (2020). Disparities in documented diagnoses of autism spectrum disorder based on demographic, individual, and service factors. *Autism Research*, 13, 464–473. <https://doi.org/10.1002/aur.2255>

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